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(54) APPARATUS FOR PRODUCING FILTER TIP CIGARETTES

(71) We, R. J. REYNOLDS TOBACCO COMPANY, a Corporation organized under the laws of the State of New Jersey, United States of America, of Main and Fourth Streets, City of Winston-Salem, State of North Carolina, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to apparatus for producing filter tipped cigarettes and the like, the filter tips being composite types which include a chamber of granular material.

It has become a well-known practice, in producing certain types of filter tipped cigarettes, to provide, first of all, a rod of filter material, such as cellulose acetate, and then to cut this rod into suitable lengths for application to cigarettes. After the cutting of the rod lengths, each of them is placed between the two cigarette columns or sections and, after uniting the cigarette sections to the filter element, the total entity is cut in half to furnish two filter tipped cigarettes.

However, when it is desired to produce filter tips of composite type which include as a smoke filtering medium a chamber of granular material, such as charcoal, many difficulties are presented. Generally what is done is that the granular material is inserted in the voids between spaced fibrous plugs of cellulose acetate or the like to form a rod-like filter assembly consisting of an alternating succession of the aforenoted fibrous plugs and chambers of granules. Various techniques for producing these rod-like assemblies may be appreciated by reference to United States Patents 3,259,029 and 3,340,775. It should be stressed that the above-cited patents are concerned with the manufacture of the composite tips as an entirely separate operation. In other words, they are directed to systems whereby a series of spaced fibrous plugs are continuously conveyed on a wrapping paper while the granules are inserted and, what eventuates is a rod-like assembly. Therefore, it becomes necessary after forming this rod-like assembly to cut it into discrete lengths to furnish individual tips, and then to unit the discrete filter lengths to the tobacco sections by the attachment techniques previously described.

According to the present invention there is provided apparatus for producing filter tipped cigarettes having filter tips of the composite type which include a chamber of granular material, comprising means for feeding discrete tubular elements, each said tubular element comprising a tobacco section and a hollow tube of tipping material extending therefrom and defining said chamber, filling means for receiving said tubular elements and filling the hollow tubes from one end with granular material, and means for sealing the chambers to insure retention of the granular material.

The basic mechanisms which embody the various features of the present invention are associated with other equipment such as driving means, timing means and the like, in order that the essential functions be carried out. However, for the purpose of clarity and simplicity in explaining the basic principles, it is considered well to highlight certain parts and to keep the associated elements in the background. Therefore, the illustrations which follow in the various figures detail only those parts which are essential to an understanding of the invention. Even though they do not depict in detail each element of the complete apparatus, they suffice to convey the essential functions in accordance with the inventive principles already pointed out. However, the basic parts depicted can not be considered in utter isolation and it must be borne in mind that they are associated with elements presented only schematically.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular

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description of preferred embodiments of the invention, as illustrated in the accompanying drawings.

Figs. 1A, 1B and 1C are elevation views, mainly schematic in form, illustrating the entire combination of apparatus in accordance with one embodiment of the present invention;

Fig. 2 is a sectional plan view taken on the line 2—2 in Fig. 1B, illustrating part of the spacing means;

Figs. 3A—3D show various stages in the processing of a filter cigarette in accordance with the technique of the present invention;

Fig. 4 is a horizontal sectional plan view of the apparatus for filling and capping the tubular elements, taken on the line 4—4 in Fig. 1C;

Fig. 5 is a fragmentary view illustrating in detail the plunger mechanism, which is part of the apparatus shown in Fig. 1C;

Fig. 6 is a fragmentary view illustrating in detail the means for feeding and inserting short lengths of fibrous rod for the purpose of end-capping filter elements.

Referring now to the figures, and for the moment to Figs. 1A, 1B and 1C, there is illustrated here the complete layout of the integrated apparatus for producing filter tipped ciarettes having tips of the type which include a chamber of granular material. The numerals 10, 50 and 100 denote the principal parts of the apparatus. In effect, what is shown is the complete production line, chiefly schematically. It will be appreciated that the numeral 10 designates apparatus that is, per se, well-known for producing conventional cigarette elements. This apparatus 10 comprises the usual tobacco feed 12 and associated conveyor 13, tobacco rod former 14, paper feed 16, conveyor 17, tongue 18, sealer 20, folder 22 and another sealer 24. As is well understood, the tobacco fed from the feed 12 is continuously formed into a rod and paper is wrapped around the tobacco rod and sealed so that what emerges from the sealer 24 is continuous rod 26 of cigarette material. The normal procedure following the final sealing operation is to cut the tobacco rod into prescribed lengths to furnish a conventional cigarette.

The apparatus designated 50 constitutes in general the mechanism or means for forming desired lengths of tobacco columns or sections and for combining the lengths with tipping paper that forms a mouthpiece for the filter cigarette. The pieces of equipment comprising the mechanism 50 include the cut-off device 52 and the spacing devices 54 and 56, which function together to insure that the correct spacing between tobacco sections is established. The device 54 comprises a pair of speed-up belts 54a and 54b and an associated side chain 54c. The side chain 54c is furnished with lugs 54d which fair in behind each cigarette section. The chain 54c is timed with the cut-off device 52 and runs slightly faster than the speed-up belts 54a and 54b. This permits the lugs to catch up with the cigarette sections and bring them to exact spacing. The exact spacing that is normally desired is the spacing required for two filter lengths.

The other device 56 for providing proper spacing is in the form of an overhead chain which is equipped with lugs 56a for maintaining exact spacing.

It will be appreciated that, per se, the accurate spacing of filter or cigarette elements is conventional in the art. However, it should be noted here that, in accordance with the apparatus up to this point, there has been provided the precise spacing required for the particular purposes of the present invention. Thus, the cut-off device 52 acts to cut the emerging cigarette rod 26 into double lengths, that is, into lengths that are sufficient for making two filter tip cigarettes, and the spacing devices 54 and 56 insure that a sufficiently long void is provided between the spaced double length tobacco sections 26a. (See Fig. 3B). These spaced sections 26a are then presented to the means for applying the tipping material as will now be described.

Tipping material 60, which is coated on its upper side, is fed from a bobbin 62 on to a conventional suction-type cutting drum 63 by the metering feed rolls 64a and 64b. The tipping material, which typically may be in the form of cork paper, is payed out from the bobbin such that the cork paper drags on the drum 63 at a slower speed than the speed at which the drum is running. The tipping material is cut to the desired length, as determined by the pay out speed, by the rotating pinch knife 66. The circumference of the cutting drum 63 is selected to be a multiple of the combined length of a double length cigarette and filter element. This is necessary so that the knife will always cut the tipping material at the same popint or points on the cutting drum to avoid cutting over suction holes at any time. The circumference of the rotating knife 66 is proportioned according to the selected multiple for the circumference of the drum 63.

As a consequence of the above-described arrangement, the peripheral speed of the cutting drum 63 can be made the same as the linear speed of the folder tape 70.

This relationship permits the cut patches of tipping material 60 as they are removed from the cutting drum 63 to be transferred directly onto the folder tape. The folder tape 70 is constituted of porous material so that the vacuum being utilized will be

effective. The folder tape 70 is fed continuously and is driven by the drum 72 from the unwind drum 73. The tape 70 rides in the bottom of a folder device 74. The drum 72 and the bottom of the folder 74 are subjected to a negative pressure through the core of the drum 72 and a plenum 75.

The mechanism as described is timed so that the tipping patches are positioned under the voids between the tobacco sections 26a. The length of these tipping patches 26b is such as to provide the required overlap to each of a pair of adjacent sections 26a. The temperature of the drum 72 and the air supplied through the associated duct 72a is sufficiently high to activate the adhesive coating on the tipping paper so that each end of a patch 26b of the tipping paper can be tacked to the two adjacent cigarette sections.

In similar fashion to conventional arrangements for folding paper and the like, a tipping patch 26b is completely wrapped around the rod. The sealer 76 then finishes the operation of completing the rod by bonding the patches 26b to the tobacco sections 26a and to itself.

The last stage of the mechanism 50 comprises another cut-off device 78. This cut-off device functions to furnish the proper length of tubular elements 28 comprising a single length tobacco section 28a and a single length hollow tube 28b, defining the end void 28c, from the rod-like assembly consisting of the alternating succession of the tobacco sections 26a and the tipping paper sections 26b. Thus, the cut-off device 78 functions to give equally spaced cuts, but these are alternate cuts in the sense that a first cut is half way through a tobacco section 26a, and the next succeeding cut is half way through a tipping patch 26b. Accordingly, what goes in as a continuous rod to the cut-off device 78 emerges as a series of tubular elements 28 whose length is equal to the length desired for a finished granular-filled filter tipped cigarette.

The filling of these tubular elements 28 is accomplished by the mechanism generally designated 100. Since, as explained, the cuts made by the cut-off device 78 are successively made half way within the cigarette section and half way within the patch of tipping paper, the result is that at the output of the cut-off device 78, successive elements alternate in their orientation. This may be seen, particularly in Fig. 3D, and it becomes necessary to arrange things so that all of the tubular elements 28 have their ends, which are to be filled with granular material, disposed the same way.

The cut tubular elements 28 are first deflected into the receiving slots 80a disposed around the periphery of the drum 80. This operation is aided by the kicker cam 82. Such an arrangement involving the use of a kicker cam is, of course, a well-known expedient, and is one of a variety of ways for deflecting cigarettes and the like onto a rotating drum or a moving belt.

The alternate elements, that is, every other element in the string of tubular elements 28 must be turned end-for-end. Device 84 is a "turn around" device for accomplishing this function. This device 84 takes the alternate elements 28 as they are received on the left side of the drum 80 and so places them on the right side so as to form a row of elements, all having their voids oriented the same way.

It should be noted at this juncture that the elements 28 are retained in the slots 80a at the periphery of the drum 80 by means of a vacuum system. This system has not been illustrated in detail because, per se, it forms no part of the present invention. This vacuum system is arranged not only to retain the elements 28 at the periphery of drum 80, but likewise, to provide transfer of the elements to the other drums which comprise the mechanism 100, and to retain same for predetermined intervals at the peripheries of these other drums.

The tubular elements 28 are transferred, in the manner noted before, to the filling and sealing means proper, which is designated 102. Thus, the elements are transferred from the drum 80 by way of the inclined drum 86 which has a bevelled periphery. The filling and sealing means 102 comprises a pair of drums 110 and 120 in an arrangement which may be likened to a twin carrousel.

It will be appreciated here and as the description proceeds that the various movable devices or elements are suitably driven and synchronized by conventional drive and timing means, as indicated schematically by the dotted lines connected to the box designated 104.

The drum 110 rotates on a vertical axis, being journaled to a shaft 112 so disposed for the purpose. The drum 110 is termed the granule filler drum because it is at this state that the granular material is fed into the tubular filter elements 28. This is accomplished as follows: The granules are fed from the hopper 114 by means of a series of metering plungers 116 extending radially above the drum 110 and carried by the drum in suitably disposed guides. The hopper 114 is rotated synchronously with the drum 110 by suitable means not shown. A plunger is provided for each of the slots 110a in the drum 110. The plungers 116 are actuated, that is, are moved in and out responsive to a stationary cam

117 which is positioned around the axis of the shaft 112.

Reference should be made here particularly to Fig. 5, where the details of one of the plungers 116 are enlarged for clarity. The plunger 116 is designed to move under the lowermost projection of the chute 114a which is an integral part of the hopper 114. The chute 114a is provided with a series of spaced orifices 114b, which are respectively aligned with corresponding apertures 116a in the plungers 116.

The plunger 116, as seen in Fig. 5, is generally rectangular in cross section. The aperture 16a extends through the plunger for accommodating a prescribed quantity of granular material for the filling of a tubular filter element. The plunger, under spring bias, is shown in retracted position in Fig. 5, whereby the aperture 116a is positioned under the corresponding orifice 114b in the hopper chute 114a. Consequently, the aperture fills up with the metered or prescribed quantity of granules from the hopper. The granules are prevented in this situation from flowing out of the aperture 116a. However, when the plunger 116 is pushed out by the cam 117, the granular material falls by force of gravity into the tubular element 28. This occurs in response to the plunger's engaging the high side of the cam 117 in its travel, i.e. as it approaches the meeting point of the drum 110 with the drum 120. This action may be best understood by reference to Fig. 4. Although the filling of the tubular element 28 is thus accounted for solely by gravity, a vertical packing device could be provided at this state to tamp down the charge of granular material.

When the void 28c at the end of a typical tubular element 28 has been filled in the manner described, the element is ready to be transferred to the next station for the end-capping operation. Thus, transfer is made of the element 28 from the drum 110 to the cap-inserting drum 120 which in construction is virtually identical to drum 110, being provided with slots 120a at its periphery. The transfer is effected by means of release of the vacuum at the meeting point of the two drums. In other words, at this point, a given tubular element 28 is shifted from its upright position in a slot 110a and is moved over to a corresponding slot 120a. The vacuum applied to the slot 120a is effective for this purpose because the vacuum normally being applied to slot 110a is released at this juncture.

As a tubular element 28 is carried along by rotation of the drum 120, whose shaft 122 is turned by a suitable gearing arrangement, a cap is inserted at the upper end of the tubular element 28 so that the granules which have been placed in the end void 28c will be retained therein. For this purpose, the end-capping device, particularly illustrated in Fig. 4, comprises a rotating transfer plate 124 at whose peripehry the caps are inserted and are carried over the tubular elements 28 as they come together with these elements disposed in the slots 120a. In this particular exemplification the caps are in the form of short plugs 126 of "Estron" (Registered Trade Mark) or similar material which is unwound from a reel 128 and suitably cut into the desired short lengths by the knife means 130.

Although the plugs of "Estron" material could be supplied to the end-capping drum 120 in trays or the like and then cut to length in a conventional manner, it has been found preferable to supply such apparatus with the long lengths of rod material supplied in a roll on the reel 128 so as to simplify the process. As is best understood from Fig. 6, the rod 132 is fed to the knife means 130 having the two rotating knives 130a and 130b. The rod 132 is fed through ledgers 134 by the feed rolls 136 to a stop at the bottom of a slot 124a on the rotating plate 124. The correct length of the plug or cylinder 126, which typically is 6—8 millimeters in length, is held in the slot by means of the vacuum, or by guide means, and is moved around in timed relationship with the rotation of the drum 120 and is placed in a corresponding slot 120a in that drum. More specifically, it is put in position just over a swaging cone 138.

By the action of the stationary cam 140 which is designed to extend around the axis of the drum 120, and which functions in timed relation with the rotation of the drum 120, a series of individual punches 142 are brought down over the receptive slots 120a. Thus, as the drum 120 rotates, a given punch 142 is so engaged by the cam 140 that the punch is pushed downwardly and consequently the plug 126 of "Estron" is pushed through the swaging cone 138 and into the open end of the tubular element 28.

It should be especially noted that the action of the punch 142 is spring-loaded so that the plug 126 is assured of contacting the granular material. By this means, voids are obviated, and yet, the granular material is not overpacked. This feature is particularly advantageous in overcoming the problem of normal variation in granular filling.

The capped filter elements 28 are preferably subjected to heat so as to bond the plug 126 to the inner wall of the tube. After being finished in this manner, the tubular elements 28 are transferred from the drum 120 by way of the inclined bevelled surface drum 150 to a receiver belt 152. Alternatively, the elements can be conveyed into a

tray filling device or into a packing attachment.

Although in the described procedure for end-capping of the tubular elements, where plugs 126 of "Estron" material or the like were used as the end caps, it will be appreciated that other forms of capping means can be utilized.

WHAT WE CLAIM IS:—

1. Apparatus for producing filter tipped cigarettes having filter tips of the composite type which include a chamber of granular material, comprising means for feeding discrete tubular elements, each said tubular element comprising a tobacco section and a hollow tube of tipping material extending therefrom and defining said chamber, filling means for receiving said tubular elements and filling the hollow tubes from one end with granular material, and means for sealing the chambers to insure retention of the granular material.

2. Apparatus according to claim 1, wherein said filling means comprises a granule filler drum having spaced slots in its periphery for receiving said tubular elements and maintaining them in an upright position.

3. Apparatus according to claim 2, wherein said filling means further comprises a hopper for containing said granular material and metering means for metering out a predetermined quantity of said granular material from said hopper and inserting it into said chambers endwise of the upright tubular elements.

4. Apparatus according to claim 2, wherein said sealing means comprises a cap-inserting drum having slots in its periphery for receiving the tubular elements, and means for inserting caps against the granular material in said chambers.

5. Apparatus as claimed in claim 4, wherein said cap-inserting drum receives the tubular elements from the granule filler drum.

6. Apparatus according to any one of the preceding claims, further comprising means for forming said tubular elements from a continuous rod of spaced axially-aligned tobacco sections interspersed with hollow tubes attached to adjacent tobacco sections.

7. Apparatus according to claim 6, including means for cutting double length tobacco sections from a continuous wrapped rod of tobacco, means for separating the double length tobacco sections with a predetermined spacing therebetween, and means for forming said hollow tubes by overlapping the inner ends of adjacent ones of said tobacco sections with tipping material so as to leave a void corresponding to twice the spacing required for an individual filter tip.

8. Apparatus for producing filter tipped cigarettes having filter tips of the composite type which include a chamber of granular material, substantially as described and shown in the accompanying drawings.

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Chartered Patent Agents,
Agents for the Applicants.

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1219744 COMPLETE SPECIFICATION

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Sheet 1

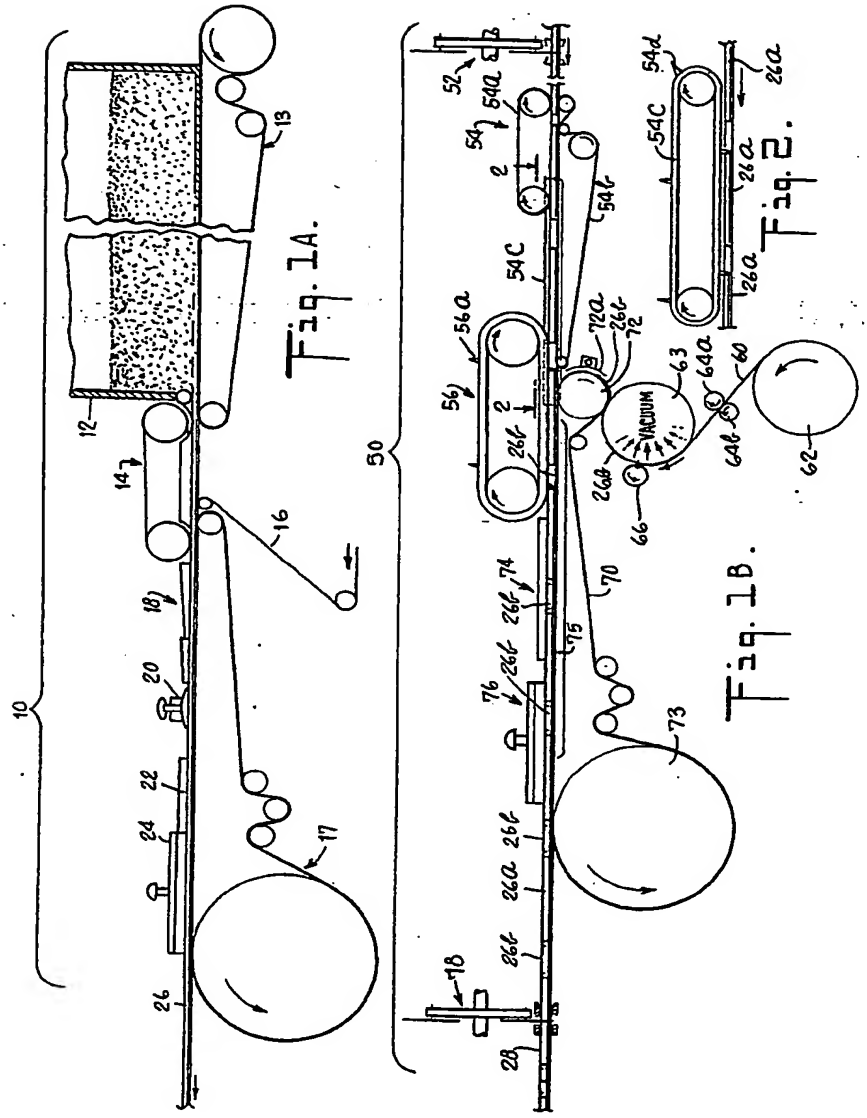

Fig. 1A.

Fig. 1B.

Fig. 2.

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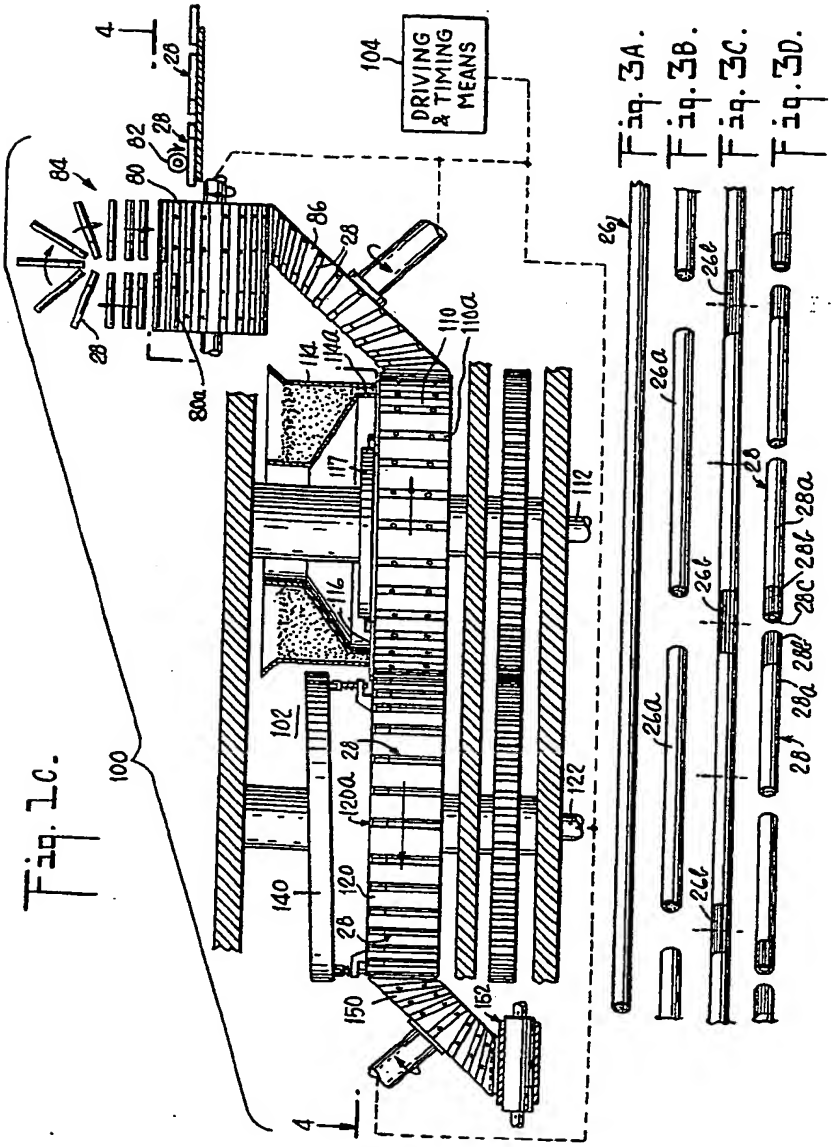

1219744 COMPLETE SPECIFICATION
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Sheet 3

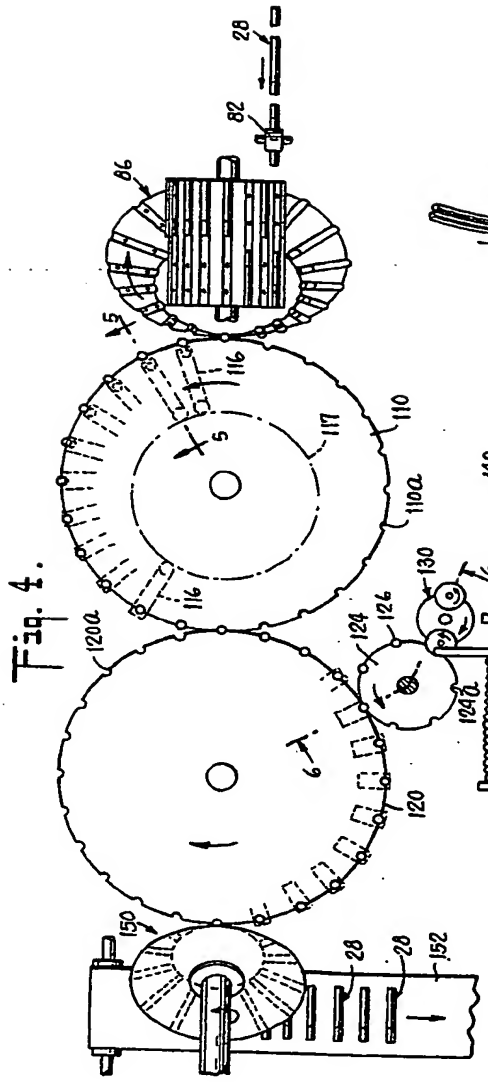

Fig. 4.

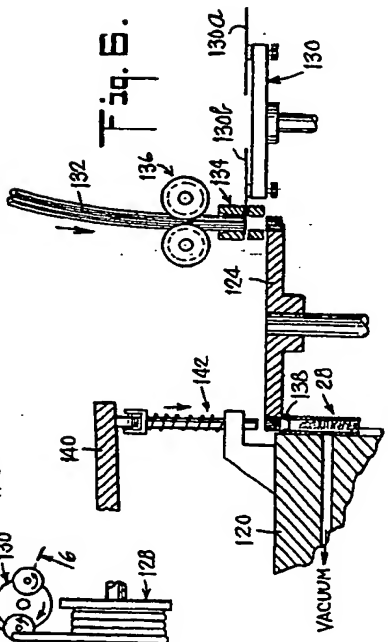

Fig. 6.

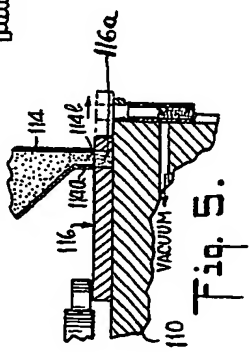

Fig. 5.